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NOTE TO REPORTERS AND EDITORS:

Attached is a copy of a speech by James M. Beggs, administrator of the National Aeronautics and Space Administration, prepared for delivery at Syracuse University April 5, 1984.

This talk contains a comprehensive summary of the status of NASA activities in two important areas:

1. Space Station development.

2. Commercial development in space.

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SALZBERG MEMORIAL LECTURE

SYRACUSE UNIVERSITY, APRIL 5, 1984

JAMES M. BEGGS

ADMINSTRATOR, NASA

Chancellor Eggers, Dr. Wallin, Mr. Salzberg, distinguished guests, ladies and gentlemen:

I am am extremely pleased to be here and very proud, indeed, to have been selected to give the Salzberg Memorial Lecture this year. I want to thank the University and the Planning Committee for this great honor.

Since 1949, the Salzberg Memorial Lecture Program has provided an important forum for examining the impact of surface and air transportation and policy (or, indeed, lack of policy) on American life and on our national economic and political infrastructure.

Space transportation is a relative newcomer to this lecture series. Only once before was it a topic for discussion. That was back in 1963 when Dr. Hugh L. Dryden, then NASA's Deputy Administrator, gave this lecture. His topic was "The Future of Air and Space Transportation."

Dr. Dryden spoke two years after President Kennedy proposed an historic national goal before a joint session of Congress. That goal was to land a man on the moon and return him safely to earth within the decade of the 1960s.

That goal was to develop into this nation's greatest technological challenge. It was to dwarf in scope even the wartime Manhattan Project for developing the atomic bomb and the postwar crash development of strategic missiles.

The Apollo program was indeed a massive effort. It required a thorough mobilization of America's industrial might, technological expertise and scientific skills. More than 400,000 persons worked in the program at its peak.

With this unprecedented concentration of resources, we achieved the goal on July 20 1969. On that day, not one, but two Americans, Neil Armstrong and Buzz Aldrin, made the first manned lunar landing during the Apollo 11 mission. By December 1972, when the program ended with Apollo 17, ten more Americans had landed on the moon and 18 had returned safely from the moon and its vicinity.

We had reaped an unassessable quantity of scientific knowledge and technological advancements. And we had achieved leadership in space, a leadership we retain today.

We could never have realized and maintained that leadership had we not - all of us in government, industry and the academic world - worked in partnership.

Apollo taught us many things.

It taught us the importance of embracing the university structure and utilizing its talents to the fullest in complex, long-term national endeavors.

It taught us how to be flexible in times of phenomenal technological change.

But, most of all, and what is most important for our country, it taught us how to marshall the best minds and talents of this nation - be they in government, universities or industry - to forge a new kind of working partnership in a large-scale program designed to meet a great national goal.

That partnership continues today, more than 25 years after NASA was established. It is stronger than ever. It has strengthened our economic and technological base, spurred innovation and productivity, created new industries and new jobs and enabled the United States to look ahead with confidence to future challenges as we continue to explore the space frontier.

We are now on the verge of a new era of commercial and industrial expansion in space that will have a major impact on America's future. It is a turning point that will set our national agenda in space well into the 21st century. In keeping with the theme of today's panel discussion - innovation and application of new technology geared toward transportation of the future - I'd like to share some thoughts with you on how we are gearing up to face the challenges of this new era.

For, while there may once have been a time when space transportation was a spectator sport, we know better today. It is now a high-stakes game that involves many players. There are the owners and operators, or carriers, if you will; the shippers, or users - scientific, commercial and industrial - and the manufacturers, who produce the satellites and the spacecraft that put them into orbit.

In the remaining 16 years of this century, there is no question that space will be the arena for expanding commercial activity in many areas, including communications satellites, launch vehicles and launch services, upper stage systems, industrial and scientific experimentation and manufacturing.

Commercial space competition from abroad is already intense, and promises to become even more so. But America holds a firm leadership position and has the technological expertise to maintain it, even as space becomes increasingly significant as an arena for international competition.

To put this new era into perspective, let us look back briefly over the past three decades. Up to now there have been four such critical turning points for the United States in the Space Age. They came about because four Presidents had the courage, vision and imagination to set the course that has enabled the nation to move forward.

The first was President Eisenhower. He made the decision to develop the Vanguard satellite in 1955. This thrust the United States into the Space Age.

The second was President Kennedy. His decision 23 years ago to send men to the moon set in motion a process that energized development of a wide range of uses for space, including the communications, weather, navigation and other satellites that have brought untold benefits to earth and that have revolutionized our lives.

The third was President Nixon, who, in 1972, approved the development of the Space Shuttle. Interestingly enough, the Shuttle was proposed jointly with development of a space station, as an integrated space transportation system that would give the United States a permanent base in low earth orbit and a reliable means to get there. For budgetary reasons, however, it was decided the Shuttle was to come first.

It remained for President Reagan to make the fourth critical decision to move us forward in space. On January 25 in his State of the Union message, he directed NASA to develop a permanently manned Space Station within a decade.

"America has always been greatest when we dared to be great," the President said. "We can reach for greatness again. We can follow our dreams to distant stars, living and working in space for peaceful, economic and scientific gain."

The President's Space Station proposal is not an end in itself. It is part of his carefully conceived space strategy designed to provide the impetus for an expanded era of space commerce and industrialization that will benefit not only the United States, but our friends and allies around the world. The strategy is rooted in the fact that the Space Shuttle, together with a Space Station, will provide the United States and its partners with an unmatched capability to live and work in space routinely and on a full-time basis.

There are other elements of this strategy, and they stem from the National Space Policy the President announced in July 1982. The policy provides a road map for our future activities in space and establishes basic goals for the space program. As set out in the policy statement, they are to:

- strengthen the security of the United States;
- maintain United States space leadership;
- obtain economic and scientific benefits through the exploration and exploitation of space;
- expand United States private sector investment and involvement in civil space and space-related activities;
- promote international cooperative activities in the national interest; and
- cooperate with other nations in maintaining the freedom of space for activities which enhance the welfare of mankind.

Consistent with those goals, the President's strategy calls not only for development of a permanently-manned Space Station, but for two more firm initiatives.

The first is international involvement in developing the Space Station. The President invited our friends and allies around the world to join with us in this program. International cooperation has been a hallmark of the United States space program since its beginnings, and has proved to be very beneficial both to our partners and to ourselves. It allows us not only to share the costs of projects, but also to share technological expertise and scientific and commercial benefits. The Space Station will offer many avenues for cooperation, ranging from joint development to joint operational missions. The President's invitation is based on his resolve to deepen our commitment to international cooperation in space.

There are numerous examples of international cooperative ventures that have benefited both the United States and its partners. Let me cite just a few examples.

The European Space Agency and Canada each contributed a fundamental capability to the Space Shuttle.

Europe's contribution was Spacelab, which orbited in the Shuttle's cargo bay during its ninth and longest mission last November 28 to December 8.

This reusable scientific laboratory was built by ten member nations of the European Space Agency at a cost of more than $1 billion. Our new satellite-based communications, tracking and data relay system enabled the scientists in orbit to consult for the first time with scientists on the ground as experiments were underway.

Spacelab returned reams of data on 70 experiments, ranging from the creation of new alloys and pure crystals to the human body's adaption to weightlessness. We are delighted with the results of the experiments and are confident that they will provide the impetus for a host of new commercial and scientific opportunities on earth and in space.

Canada's contribution to the Shuttle is the Remote Manipulator System, or robot arm, which extends the Shuttle's capabilities manyfold.

In keeping with our policy of international cooperation in space and with its contributions to the Shuttle system, Europe has already flown a payload specialist on the Shuttle, and will fly many more. And so far, three Canadians are scheduled to fly - the first in October; the second, next year and the third in 1986.

A cooperative program that has benefited mariners, pilots and their passengers around the world is the the COSPAS-SARSAT program. This is a satellite-aided search and rescue system developed by the United States, Canada, France and the Soviet Union. Since it began operating in June 1982 it has been credited with helping to save some 145 lives from planes and ships in distress.

Another cooperative program that has produced a wealth of astronomical data that scientists will be analyzing for years to come is the Infrared Astronomy Satellite, or IRAS. This satellite was developed by the United States, the Netherlands and the United Kingdom. Its discoveries so far have included two possible solar systems in formation around stars other than our sun; several hitherto unknown comets, 20,000 hitherto unknown asteroids and evidence of a collision between two heavenly bodies, such as comets or asteroids.

Three weeks ago, I returned from a trip to Europe, Japan and Canada made at the President's request. He had asked me to follow up on his invitation to our friends to join with us in developing the Space Station and to begin to lay the groundwork for such cooperation.

Over the past two years, Europe, Canada and Japan have shown a keen interest in the Space Station. They have initiated studies paralleling our own on mission requirements and we have exchanged information. In our meetings abroad I found our friends extremely enthusiastic about the prospect of joining with us in this program. And, as we look to the future, I have every expectation that we will be working together.

The third element in the President's strategy for space is designed to encourage American industry - not just the aerospace industry - to move quickly and decisively into space. He called for government and the private sector to work as partners in a new program for economic development in space in connection with the Space Station's development and operation.

American industry is already beginning to respond. Only two weeks after the President's State of the Union Message, the 3M Company, one of the nation's largest manufacturing firms, announced that it will begin a long-range basic research program in space aimed at producing commercial products in orbit. The company hopes to have its initial experiments ready to fly on the Shuttle by August. NASA has a working agreement with 3M that will facilitate their work in this area.

3M is interested in investigating the prospects of processing and manufacturing coatings, or very thin films and organic crystals in space. Both of these have broad applications industrially throughout the world. This is an area that we believe holds extremely high promise for industry, and one which will be given high priority on the Space Station.

Indeed, more and more companies - there are now about 20 - are in various stages of discussion with us on cooperative space research projects. We expect the results of these projects eventually to find their way into the commercial arena, either as products and services to be manufactured and offered in space; or as research results that will enable us to produce new products on earth. And both will be important.

The most notable advances in space processing so far have been in a program known by the rather arcane name of Electrophoresis Operations in Space. It is a joint project of the Ortho Corporation, a division of Johnson and Johnson, and McDonnell Douglas in cooperation with NASA.

Electrophoresis is a widely-used process in the medical and pharmaceutical field. It involves electrically stimulating a biological substance to separate its constituent parts.

On earth gravitational forces permit only a small amount of material to be extracted at any one time. But in space, as has been proven in tests on several Shuttle missions, the same electrophoresis equipment used on earth produces 700 times more material, with five times the purity than that produced on earth.

McDonnell Douglas and Johnson and Johnson are extremely enthused and encouraged by these tests. They have invested considerable resources in this program and say that they could be ready to start commercial pharmaceutical production in space by 1987.

This first factory in space could be aboard an unmanned free-flying platform, at first, and be Shuttle-serviced. Later the platform could become an integral part of an operational Space Station. This could open the door to an entirely new family of space-processed medicines and vaccines for more effective treatment of cancer, diabetes, hemophilia, emphysema and a variety of other diseases.

Even before that, however, we expect to see the first products manufactured in space on the commercial market.

NASA and the National Bureau of Standards are working on a plan to market incredibly tiny and perfect spheres of latex plastic which are exactly equal in size. The spheres were manufactured aboard the Shuttle with a NASA-developed device called the Monodisperse Latex Reactor. They will be extremely useful to calibrate optical devices or as biological and chemical laboratory filters.

Our studies and those of our contractors clearly see manufacturing as only one of a host of Space Station functions that would enhance commercial opportunities in space.

Some of the other uses we have projected are as:

- o a laboratory in space, to conduct scientific experiments and develop new technologies;
- o a permanent observatory to study the earth and the universe;
- o a transportation node where payloads and vehicles are stationed, processed and propelled to their destinations elsewhere in space;
- o a servicing facility, where payloads and spacecraft are maintained, and, if necessary, repaired;
- o an assembly facility where, with ample time on orbit and the presence of appropriate equipment, large structures are put together and checked out; and
- o a storage depot where payloads and parts are kept for subsequent deployment.

Perhaps more important than any of these potential functions, however, are activities that we can not even imagine today. This is because a permanently manned Space Station will represent a fundamentally new and versatile capability to do new things in new ways. And it is hard to predict today where that capability, combined with our vision and imagnation, will lead us.

What we do know, however, is that a permanently manned Space Station will be the key to our future activities in space - scientific, industrial and commercial.

With it, we will be able to tend and monitor equipment, which will be largely automated for production, but will need replenishment of consumables used in the various activities. And with it, we will be able to remove finished materials, package them and send them back to earth via the Shuttle.

A Space Station will be a true research center, enabling us to carry on in space the same types of experimental work carried on in industrial research laboratories on earth. And, as such, it will enable us to take the next giant steps into the future.

As we learn from working in the Space Station, we will, undoubtedly, add to it, because the initial modular design will allow it to be expanded to add new capabilities and new manufacturing and research activities.

I am confident that once we get the Space Station fully operational and have learned how to use it, that we will want to expand it. One impetus for expansion, for example, will be solar system exploration. We will probably be thinking about returning to the moon, this time to begin to mine its resources, because it will be relatively easy to go from the station to the moon.

Beyond the moon, we will begin to send many more unmanned probes to the neighboring planets, or even to the outer regions of the solar system.

Eventually, perhaps, we could fulfill Wernher von Braun's great dream and mount a manned visit to Mars. We know there is water there because we have seen on Mars an erosion canyon seven times longer and three times deeper than the Grand Canyon of the Colorado. By studying that canyon we might get insights into Mars' geological history, insights into the sun's development and, perhaps, insights into whether Mars might be made habitable for humans.

Let me turn now to what NASA has in mind conceptually when we talk about a Space Station. I say "conceptually" because we do not yet have a Space Station design. With Congressional approval of the Space Station proposal, we plan to initiate a two-year definition effort with industry. This effort will result in development of the overall configuration and preliminary design of the station's various elements.

If all goes as planned, early in 1987 we will be ready to move ahead into the development and construction phase, with the goal of having the station in orbit and ready to begin operations in the early 1990s.

The station, as currently conceived, will be a multifunctional, permanent facility. It will be placed in low-earth orbit element by element and assembled with the aid of the Shuttle's arm, and, possibly, astronauts conducting extravehicular activities or, as we call them, EVAs. Once assembled, it will be tended by the Shuttle.

The station will be modular in design to maximize potential for evolutionary growth in both size and technology. Another advantage of the modular concept is that companies and/or countries would be able to have discrete areas that are essentially their own, and thus, would be able to protect their proprietary interests.

The station will also be designed for indefinite life on orbit through the use of maintainable and restorable systems. And it will incorporate advanced automation technology to maximize productivity.

The station will consist of a manned base and associated unmanned platforms. These platforms would be oriented towards various scientific and industrial functions, such as astronomical observations and materials processing. They will be tended from the base by astronauts using the Manned Maneuvering Unit or jet-powered backpack, and possibly tethered to the base; or by an Orbiting Maneuvering Vehicle, or OMV.

We are now developing an OMV to use with the Space Shuttle. It can best be described as a multi-functional, remotely-controlled, rocket-powered space taxi. It will be equipped with a television camera and be guided by a person on the ground, on the Shuttle or on the station itself.

The base is now conceived as a cluster of functionally-oriented modules.

Although the key elements may change as our work progresses, we envision them to include a utility module to provide essential services to the cluster, such as power and thermal management; a berthing and assembly module; a module containing crew living quarters; a laboratory module for working; a logistics module for supply and replenishment; and pallets or platforms to which are attached scientific instruments and repair equipment for both the base and the platforms.

The Space Station will cost approximately $8 billion through the early 1990s, when it becomes operational. As more requirements emerge, it would be expanded.

A crew of six to eight persons will live and work in the station for periods of three to six months. The station complex will employ people in tasks and roles where their presence is uniquely valuable. Our experience and our intuition tell us that people will have an important role to play in key Space Station functions. But we also realize that under some circumstances, certain activities of a routine nature or those that can be preprogrammed, are better suited for automated systems.

Our biggest challenge in designing the Space Station, therefore, will be to find the proper mix of man and machine to optimize station capabilities.

We need to think hard about how to best employ the two modes of space flight, manned and unmanned, and come up with the optimal blend that will enable this multi-functional facility to best serve a variety of needs.

Now it's one thing to speak about expanding the commercial use of space; but quite another to, as Shakespeare put it, "endeavour deeds to match those words."

Before I share with you what actions we are taking and plan to take, I think it might be both interesting and useful, to draw a brief analogy between what government is doing to open space to private investment and what it did to foster development of our highway and airport and airways systems and our railroads.

The key to development of all transportation modes in the United States has been a publicly-funded infrastructure.

For the railroads there were land grants, and, until the creation of the Interstate Commerce Commission in the late 1880s, there was a laissez-faire policy on routes and rates.

For the highways, there were Federal and state funds, with the Federal Government paying the lion's share; and a system of user taxes.

The commercial air transport industry got off the ground in the 1920s with the government-run postal service as its sole customer. The national network of airports and airways were built and are maintained through user taxes and government subsidies on both the state and national levels.

Congressional approval of the President's Space Station proposal will send a signal to industry, and indeed, to the world, that the United States will establish a permanent infrastructure for the economic development of space. This signal will enable the private sector to move quickly, decisively and with confidence into space investments.

In principle, the infrastructure we are putting in place to develop space will be no different than those we established to meet the great transportation goals of earlier years. In realizing those goals we expanded and strengthened our economy by spurring private investments through the use of hitherto untapped government resources.

Such investments in developing our last and greatest frontier will spark a quantum leap in economic growth that will enhance the nation's competitive position in international trade, contribute to progress in science and technology and, most importantly, help to maintain United States leadership in space.

Bertrand Russell once wrote, "In our complex world, there cannot be fruitful initiative without government, but unfortunately, there can be government without initiative."

While our system of government is not perfect, few would argue that it has not served us well by providing a strong infrastructure and flexible framework for economic expansion at crucial periods in our history.

As we prepare for economic expansion in space two of the three elements of the infrastructure we will need are in place.

The first is the firm and consistent National Space Policy I spoke of earlier. The policy calls clearly for government to develop "a climate conducive to expanded private sector investment and involvement in space activities."

The second is an operational Space Transportation System, with the Space Shuttle as its centerpiece. The system is economical, reliable and efficient and we are working to make it even more so, since it is the key to routine access to space for both civil and national security missions. And it will be the key to Space Station development and operations.

Indeed, tomorrow the Shuttle will begin a mission to be highlighted by the first repair of a satellite in orbit. This is enormously significant from the standpoint of demonstrating our increasing ability to work in space; and from the standpoint of economy , because it will salvage the $75 million Solar Maximum Satellite and put it back to work in the interest of scientists the world over.

The Space Shuttle is demonstrating that it can do all it was designed to do and more. It is a truly remarkable vehicle - a versatile and dependable national asset. And as the fleet grows our capabilities grow with it.

Discovery, the third orbiter, will join Columbia and Challenger in June. And Atlantis, the fourth orbiter, is scheduled for its maiden mission next May. As the market expands, and I have every confidence it will continue to do so, the flight rate will expand with it. We expect to be flying about two dozen times a year by the end of the decade, and to build up to a flight rate of 30 or 40 times a year by the end of the century,

The third element to complete the space infrastructure will be the permanently-manned Space Station.

Through public opinion polls the American people have indicated they will support development of the station. For example, a recent Harris Poll on public attitudes towards science and technology showed that 70 per cent of those polled favored development of a permanent space station and believed it would improve the quality of their lives.

Congressional approval will not only affirm public attitudes, but also make it possible realize that objective.

Last year, in response to the President's National Space Policy, NASA established a task force to develop an agency-wide policy and program plan to enhance the agency's ability to encourage and stimulate free enterprise in space. The task force's report is now being reviewed by our top management people, and I'd like to share its essence with you.

The task force reached three general conclusions.

The first is that commercial activities in space by private enterprise need to begin now if our nation is to retain and improve its leadership in science and technology, its high living standards, and its advantages in international trade.

Secondly, the task force stated that natural and bureaucratic barriers inhibiting the commercial use of space need to be and can be relieved or removed through actions of the Government and private enterprises.

And finally, the task force declared that with firm resolve and the commitment of resonable resources over a number of years, a partnership between government and private enterprise can turn space into an arena of immense benefit for the nation.

The task force indentified five principles to govern the NASA Commercial Space Policy. They are:

First, Government should reach out to and establish links with the private sector.

Second, Government should not be the overall judge of a project's feasibility or impede private efforts to undertake commercial space ventures.

Third, If the private sector can operate a space venture more efficiently than the government, then such commercial utilization should be encouraged.

Fourth, Government should invest in high-leverage technologies and space facilities which encourage private investment, and should, in general, refrain from space activities the private sector is willing to undertake. And finally, Government will consider a significant contribution to a private sector initiative under two conditions: there must be significant private capital at risk; and there must be significant potential benefits for the nation, such as a contribution to economic health or to a positive balance of trade.

NASA intends to establish a high-level office to serve as the focal point for our activities in stimulating space commerce. We intend to consider support for three specific types of commercial space ventures. In priority order, they are: new commercial high technology ventures; new commercial applications of existing space technology; and, commercial ventures resulting from the transfer of existing space programs to the private sector.

Business in space offers great promise. But it also holds great risk, financially, institutionally and technically. We plan to reduce those risks with a three-pronged approach.

On the financial side, we will continue to offer reduced-rate space transportation for high technology endeavors and we plan to help integrate commercial equipment with the Shuttle. We will also provide seed money to stimulate commercial space ventures, and, in some cases, we will purchase commercial space products and services. To protect proprietary rights in this high-risk arena we will provide some forms of exclusivity.

To reduce institutional risks, we will speed integration of commercial payloads into the Shuttle and speed proposal evaluations for NASA/private sector joint endeavors. We also plan to establish procedures to encourage development of space hardware and services with private capital, and to introduce new institutional approaches to strengthen our support of private investment in space.

On the technical side, NASA will support research aimed at commercial applications and continue to encourage expanded access to NASA experimental facilities and exchange of information with our scientists and engineers. We will provide dedicated flight opportunities, assured flight schedules and a "fast track" to space for commercial ventures.

Twenty-one years ago, NASA pioneered satellite communications. Their growth into a multi-billion-dollar industry illustrates the domestic and international implications of the commercial use of space.

As the lead government agency in both civil space activities and in the development of advanced research and technology, NASA stands ready to assist industry once again in furthering private investment in space.

I hope this talk has given you a useful perspective on our plans, policies and procedures as we work towards directing space transportion towards the needs of the future.

The dimensions of that challenge are huge, indeed. And we are doing our best to meet them, not only for our sake but for for the sake of future generations.

Sixty-two years ago, the great Spanish philosopher Jose Ortega y Gasset wrote, "Nations are formed and are kept alive by the fact that they have a program for tomorrow."

We have a program for tomorrow on the drawing boards today. And it is my hope that vision, will and pragmatism, which have always characterized the American spirit, will continue to drive our endeavors as we thrust to ever greater heights among the stars.

Thank you very much.

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